

# **Town of Dover Community Center**

Building Committee

- Sustainability Strategies

Sept. 13<sup>th</sup>, 2021

# Building a vision Building consensus

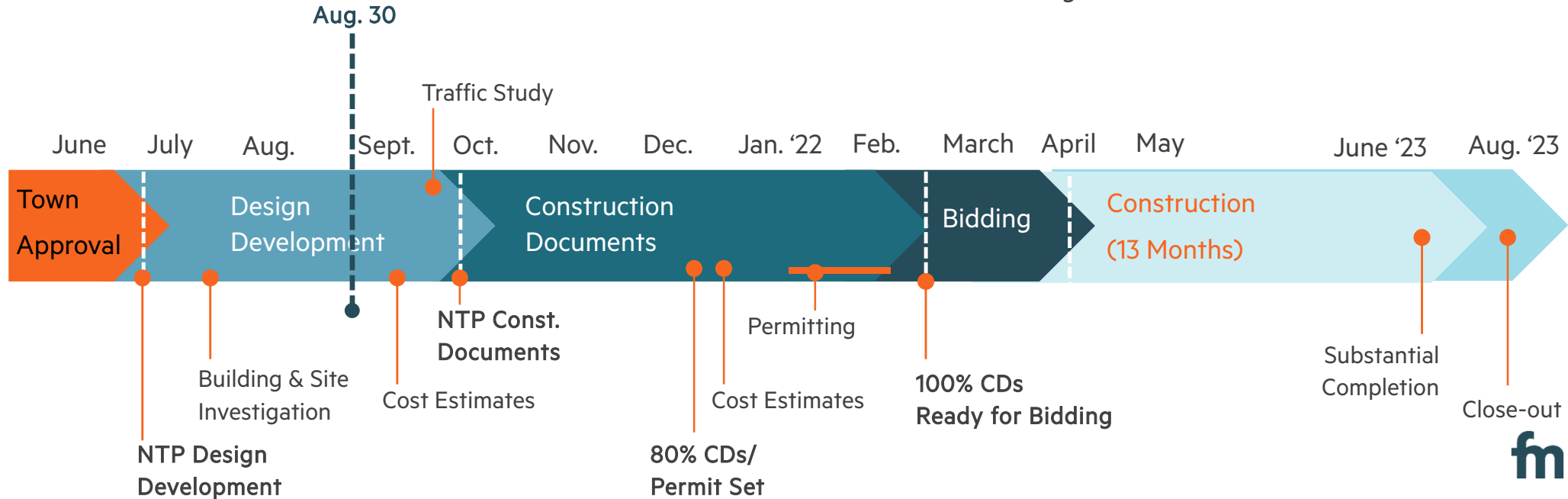
## Sustainability Strategies

1. Energy Efficiency
2. Power Production
3. Site Lighting – Dark Sky
4. Interior Air Quality
5. Sustainable Materials

# Design Scheduled Meetings

## Upcoming Building Committee Meetings

- DD Kick-off/ Recreation – 7/12
- Landscape Development – 7/26
- A/V , Security – 8/9
- Finishes –Exterior/Interior – 8/30
- **Sustainability** – 9/13
- DD Design/ Cost Estimate – 9/27



# Energy Efficiency Strategies

Maximizing Grant Possibilities

Eversource – Sept. 14<sup>th</sup>

DOER- Green Communities

Energy Conservation Measures (ECMs):

- Increased Insulation
- Lower Window U-Value
- Heat Pump (Mechanical System -HVAC)
- Energy Recovery (DOAS units)
- Variable Frequency Drive Pumps (VRD)
- Low Lighting Power Density (with LED lighting)
- Electric Vehicle Charging Stations
- Load Shifting – Generator
- Photovoltaic Panels (PV)



28  
kBTU

Current Model

80  
kBTU

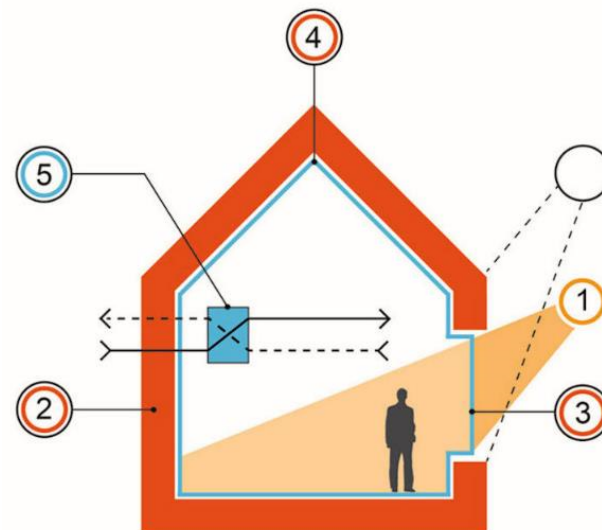
Existing



# Major Factors in Energy Use

HVAC is most significant

1. Solar Heat Gain /Orientation
2. Insulation
3. Window U-Value
4. Tight Envelope
5. Mechanical System (Heating/Cooling/ Air)



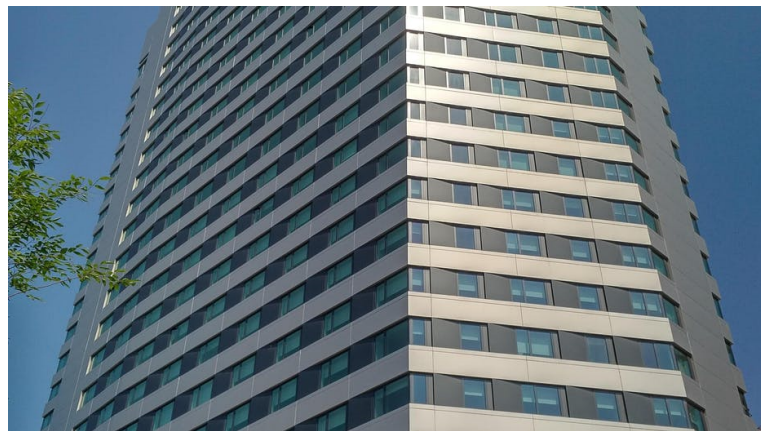
	Baseline (EUI=28)	Upgrade	Upgraded EUI	
• Roof Insulation:	R-30	R-50	26.4 kBTU/sf	-1.3
• Wall Insulation :	R-20	R-30	27.2 kBTU/sf	-0.7
• Tight Envelope:	CODE			
• Windows U-Value:	U=.28	U=.24	27.4 kBTU/sf	-0.3
• Windows Solar Heat Gain	SHGC=.28	SHGC=.21	28.4 kBTU/sf	+5

Dover Envelope Calculations	
	R-value
Outside air film	0.17
4" Brick	0.725
Air space	0.68
Mineral wool (4")	16
1/2" gypsum	0.45
Stud cavity	1
1/2" gypsum	0.45
Interior air film	0.68
<b>Total</b>	<b>20.155</b>

# Major Factors in Energy Use

Looking for incentives for increase insulation

1. Solar Heat Gain /Orientation
2. Insulation
3. Window U-Value
4. Tight Envelope
5. Mechanical System (Heating/Cooling/ Air)



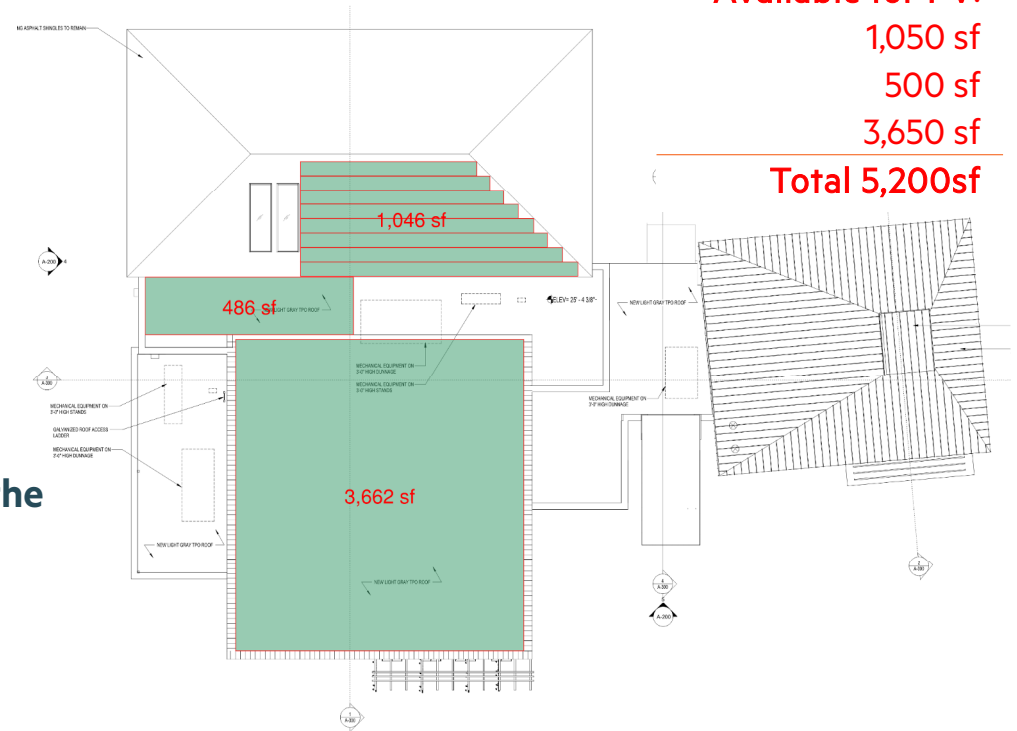
Cornell House, NYC Passivehaus Standard  
280mm (11") of mineral wool insulation

	Baseline (EUI=28)	Upgrade	Upgraded EUI		Additional Insulation
• Roof Insulation:	R-30	R-50	26.4 kBTU/sf	-1.3	6" -> 10" XPS (R-value: 4.7 per inch)
• Wall Insulation :	R-20	R-30	27.2 kBTU/sf	-0.7	4" -> 6.5" Mn. Wool (R-value: 4.0 per inch)
• Tight Envelope:	CODE				MA Airbarrier requirement best in country
• Windows U-Value:	U=.28	U=.24	27.4 kBTU/sf	-0.3	Argon filled, best thermal breaks (aluminum)
• Windows Solar Heat Gain	SHGC=.28	SHGC=.21	28.4 kBTU/sf	+5	

# Energy Savings

## PV Potential

1. Maximizing area for PV
2. Designing structure for PV panel load
3. Seeking grants for Community Center Project
4. Likely too small as stand-alone – will confirm
5. Town is looking to restructure the PV Project @ the Highway Dept. roof
6. Comm. Center roof will be ready for future installation



5,200 sf installation = 72.5kW

93,860 kWh/yr \* = 60% of projected 154,683 kWh  
(based on EUI of 28)

\*NREL [pvwatts.nrel.gov](http://pvwatts.nrel.gov)

# Site Sustainability

## The Dover Way

### Maximum green space

### Native/adapted plantings

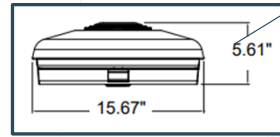
- No permanent irrigation

### Site Lighting

- Sufficient for safety
- Minimize light trespass
- Dark Sky Compliant



SL660 SOLANA SERIES  
Dark Sky Compliant U0 BUG rated luminaire



Wall-mounted  
safety lighting



**Proposed EV  
charging stations**

**Side shielding at  
south-most lights**



# Interior Air Quality

## Fresh Clean Air

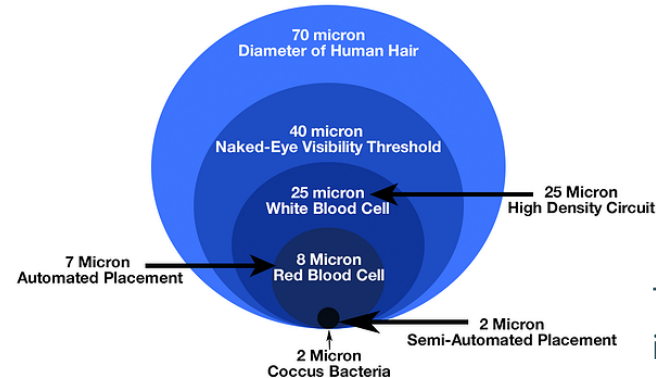
### 1. Outside Fresh Air

- Standard is 4 air changes per hour
- 70% greater than Code for 1910 wing
- 20% greater than Code for peak occupancy in new areas (Gym, Community Room, etc.)
- System is capable of significant overventilation when desired

MERV Rating	Air filter will trap particles sized .3 to 1.0 microns	Air filter will trap particles sized 1.0 to 3.0 microns	Air filter will trap particles sized 3.0 to 10 microns	Filter Type & Particles Removed
MERV 1	<20%	<20%	<20%	Fiberglass and Aluminum Mesh pollen, dust mites, spray paint, carpet fibers, pet dander
MERV 2	<20%	<20%	<20%	
MERV 3	<20%	<20%	<20%	
MERV 4	<20%	<20%	<20%	
MERV 5	<20%	<20%	20% - 34%	Disposable Filters mold spores, kitchen aerosols, hair spray, furniture polish, household cleaning sprays
MERV 6	<20%	<20%	35% - 49%	
MERV 7	<20%	<20%	50% - 69%	
MERV 8	<20%	<20%	70% - 85%	Home Box Filters lead dust, flour, auto fumes, welding fumes
MERV 9	<20%	>50%	85% or better	
MERV 10	<20%	50% - 64%	85% or better	
MERV 11	<20%	65% - 79%	85% or better	Commercial Filters bacteria, wildfire smoke, respiratory droplets
MERV 12	<20%	80% - 90%	90% or better	
MERV 13	>75%	90% or better	90% or better	
MERV 14	75% - 84%	90% or better	90% or better	
MERV 15	85% - 94%	95% or better	90% or better	HEPA and ULPA viruses, carbon dust
MERV 16	95% or better	95% or better	90% or better	
MERV 17	99.97%	99% or better	99% or better	
MERV 18	99.997%	99% or better	99% or better	
MERV 19	99.9997%	99% or better	99% or better	
MERV 20	99.99997%	99% or better	99% or better	

### 2. Merv 13 Filters

- MERV 13 is LEED standard
- We will have MERV 13 for all RTUs and DOAS
- We do not recommend HEPA due to loss of efficiency
- Currently not planning on UV treatment (needs time to expose ventilation air to UV = large ducts)

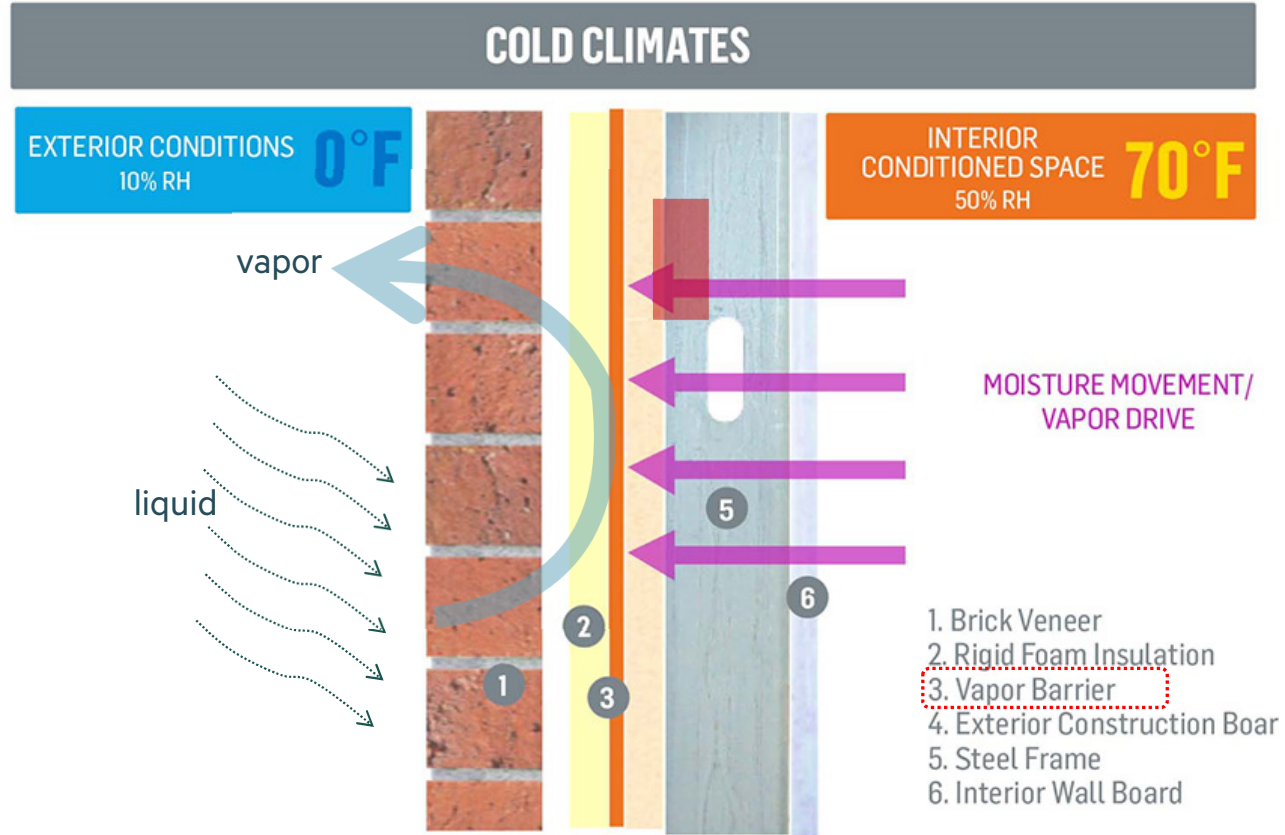


The Corona virus is 0.1 microns

# Moisture Management

Tight Building Envelope = Energy Savings

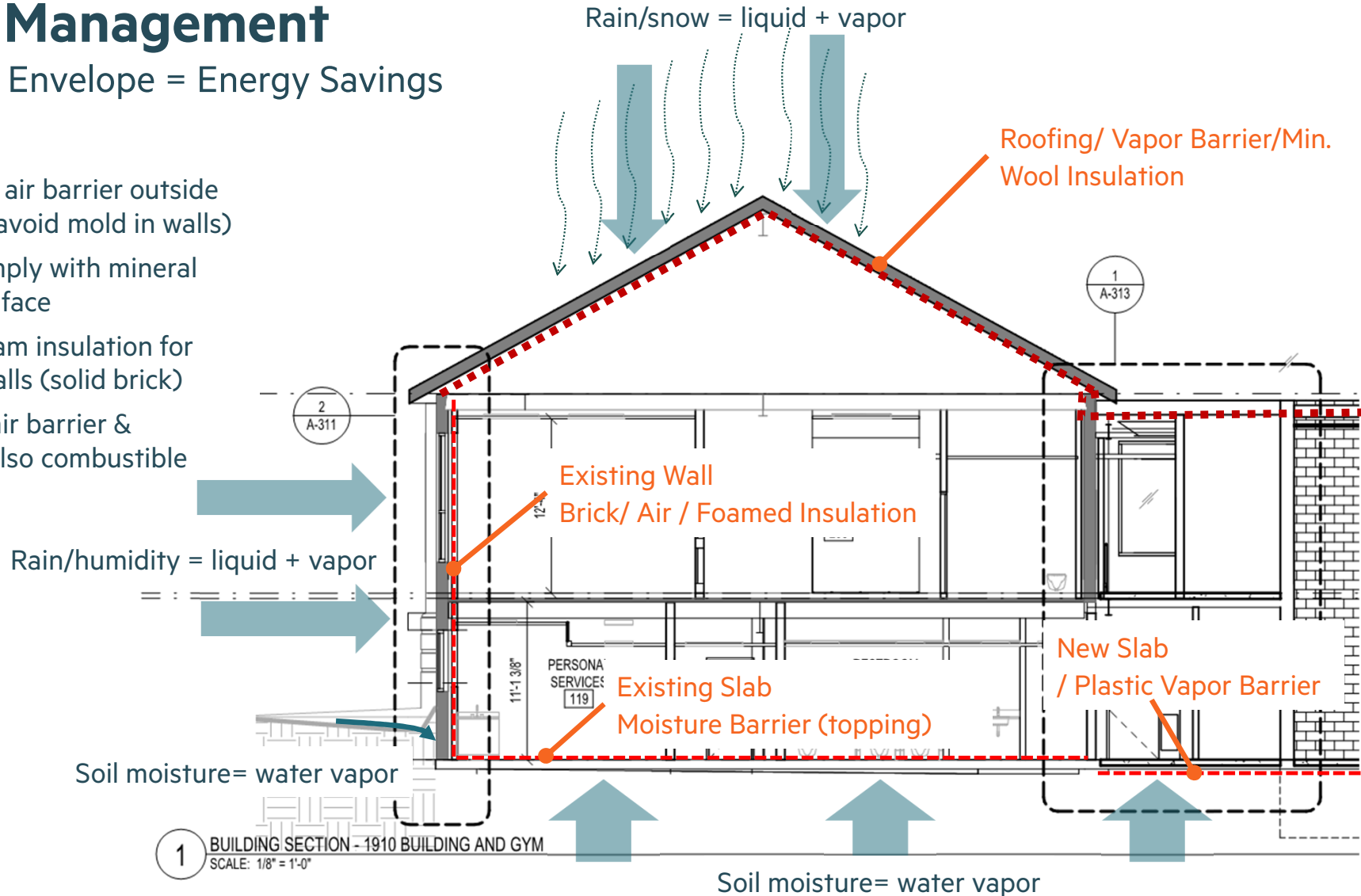
- MA Code is best in the country
- MA Code requires air barrier outside of stud cavity (to avoid mold in walls)
- New walls will comply with mineral wool behind brick face
- Planning spray foam insulation for behind existing walls (solid brick)
- Spray foam is an air barrier & insulation, but is also combustible
- Mineral wool (non-combustible) is typical insulation
- Mineral wool is Formaldehyde free, non-toxic in fire



# Moisture Management

Tight Building Envelope = Energy Savings

1. MA Code requires air barrier outside of stud cavity (to avoid mold in walls)
2. New walls will comply with mineral wool behind brick face
3. Planning spray foam insulation for behind existing walls (solid brick)
4. Spray foam is an air barrier & insulation, but is also combustible



# What are VOCs?

## A major factor in Indoor Air Quality

Volatile organic compounds are compounds that have a high vapor pressure and low water solubility. Many VOCs are human-made chemicals that are used and produced in the manufacture of paints, solvents, pharmaceuticals, and refrigerants. VOCs are common ground-water contaminants.

- EPA.gov

### Symptoms

Can range from mild irritation to severe reactions. Some VOCs have been classified as group 1 carcinogens:

- Dizziness
- Headache
- Nausea
- Nasal Congestion
- Rashes
- Persistent Cough
- Eye irritation
- Lethargy/ Fatigue
- Increase angina
- Vomiting

## TYPES

There is a high variety of carbon based chemicals (VOCs) and for each one WHO has a guideline. Based in its different boiling points there are three distinct groups from very volatile, volatile to semi volatile. Some are known as carcinogen like Formaldehyde and Benzene. Others cause neurological harm as Toluene.

### most known VOCs

#### formaldehyde

is a known carcinogen gas, colorless and flammable at room temperature. It is present in very large amount of household products.



#### benzene

is a genotoxic carcinogen gas that evaporates into the air quickly and has been known to contaminate food and water. Among the many sources it can be found in tobacco smoke, fuels and exhaust from cars.



#### toluene

or methylbenzene is a colorless, water-insoluble liquid with smell. It can be found in many paints, glues, adhesives and disinfectants.





# / Sustainable Materials

1. Following LEED credits and Harvard's Harmful Chemical List
2. Low emitting ( Volatile Organic Compounds)
3. Durable, low maintenance
4. Recycled and/or natural materials

Material	Low Emitting	Durable	Recycled/Natural	Standard
Brick	Yes	Yes	Natural, regional	
Slate	Yes	Yes	Natural, regional	
Zinc	Yes	Yes	Natural	
Mineral Wool	Yes	Yes	Natural (97%)	GreenGuard Gold
Paint	Yes			GreenGuard Gold
Carpet	Yes			Carpet & Rug Institute (CRI)
Linoleum	Yes	Yes	Linseed oil	GreenGuard

# Low Voc Paint & Carpet

- 1. Low emitting** Zero-VOC paint now available, low VOC carpet
- 2. Durable, low maint.** FM will specify commercial paints, carpets but these are inherently not durable finishes
- 3. Natural material** both are largely synthetic materials with minimal post-consumer recycled content
- 4. Uses** Interior walls (clean-able), acoustically sensitive rooms (carpet)  
waterbased paint and carpet tiles are easy to repair/replace

Volatile organic compounds are compounds that have a high vapor pressure and low water solubility. Many VOCs are human-made chemicals that are used and produced in the manufacture of paints, solvents, pharmaceuticals, and refrigerants. VOCs are common ground-water contaminants. - EPA.gov



**GREENGUARD:** Paints that receive the [GREENGUARD label](#) must have less than 50 grams of VOCs per liter to be certified. GREENGUARD has different levels of certification, including GREENGUARD Gold, which has strict requirements and considers sensitive populations such as children and the elderly.



The Carpet and Rug Institute's [Green Label Plus Indoor Air Quality Standard](#) identifies carpet, adhesive and cushion products that meet or exceed government indoor air quality regulations and are among the lowest VOC-emitting products on the market

# / Linoleum

## 1. **No VOCs – Linseed oil/Flaxseed oil as binder**

Does have natural odor for first month or so

Common alternate (VCT tile) is high in VOCs and requires annual striping

## 2. **Durable and easy to clean – used in WWII battleships**

Common alternate (VCT tile) is high in VOCs and requires annual striping

Manufacturer (Forbo) has a 10 year warranty and they suggest a 15-25 years as life expectancy in commercial setting, but hardens over time and could easily last 40 years. **Does not have a glossy finish.**

## 3. **Natural Materials (wood dust, pine rosin, jute, limestone)**

No use of synthetic materials like PVC or Polyolefin.

<1% topcoat (primarily water-based urethane)

No phalates – a known carcinogen in VCT flooring

## 4. **Biophilic properties**

Naturalist patterns and colors are considered bio-philic (evoking our ingrained love of nature) which studies have found to be calming to people of all ages.

## 5. **Renewable, Recycled**

70% rapidly renewable materials

43% recycled content



Field of Flax



Marmoleum Tiles

# / Linoleum

## Manufacturing Process

### **Marmoleum CO2 neutral** (brand of linoleum)

The weighted average of Marmoleum product range is CO2 neutral (cradle to gate) without offsetting, which does not affect the worldwide climate change. It combines ecological values with contemporary design and offers an important contribution to a sustainable world.



### **Flax seed oil**

The main ingredient in Marmoleum is flax seed oil, produced by pressing the seeds of the flax plant. The flax plant is an easy-to-cultivate species delivering annual crops of flax seed as well as fibers for the textile industry.

#### **Properties of Flax:**

- Taking up CO2
- Almost no waste in the production chain
- Flax seed oil: virgin rapid renewable raw material



### **Wood Flour**

Wood flour is obtained from the remainders of the timber industry. The wood of roots and branches is finely grinded and used in linoleum. No tropical hardwoods are ever used.

#### **Properties of Wood Flour:**

- Trees take up CO2 during their growth
- Recycled renewable raw material



### **Pine Rosins**

Pine rosins are mixed with the vegetable oil pressed from the flax seed to produce a flexible binder. The pine trees from which the rosins are extracted come from controlled forestry locations throughout the world.

#### **Properties of Rosins:**

- Originating from trees that take up CO2
- A virgin rapid renewable raw material



### **Jute**

The reverse side of Marmoleum is made from woven jute. Jute (also known as hessian or burlap) is a natural and important eco-friendly vegetable fiber. It is produced from the stalks of the jute plant. Jute is plentiful and highly renewable.

#### **Properties of Jute:**

- No waste-crop, taking up CO2 during growth
- Rapid renewable virgin raw material





# Low VOC Carpet

## 1. CRI+ Label

VOCs typically in adhesive and padding  
CRI + label assures low VOC

## 2. Waste

Generally carpets are not considered sustainable due to high turnover = waste

## 3. Maintenance

Carpet tile recommended for easy repair of damaged/stained areas

## 4. Acoustics

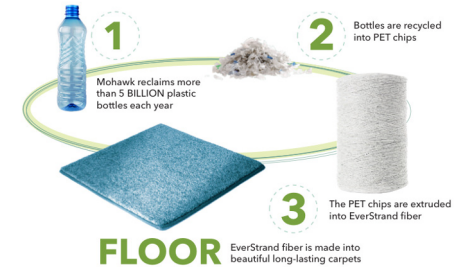
Carpet is excellent for office acoustics (speech privacy)

## 5. Recycled Content

Carpets now available with recycled post-consumer fibers (PET bottles, fishing nets)  
Up to 80% recycled content



### Bottles-to-carpet Process



# Indoor Air Quality

## Minimizing Impact of Footborne Contamination

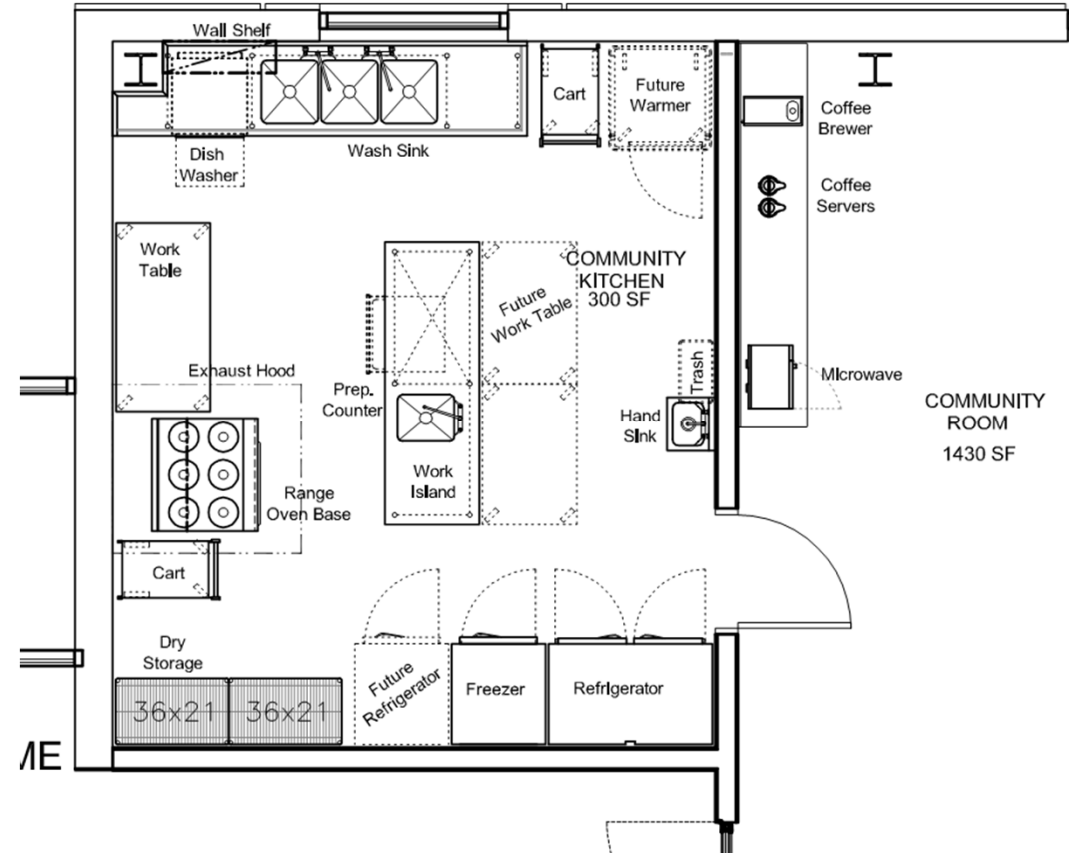
1. **Dirt from foot traffic is largest source of interior air contamination**
2. **Walk-off mat style carpet tiles now available**
3. **No slab depression needed –matches linoleum/ tile**
4. **Recommend outdoor grating in addition to indoor mat**

The International Sanitary Supply Association reports that most of the dirt within a building is tracked in on people's shoes, and that 85% of this can be removed if entry mats are properly designed and maintained.



# Kitchen & Water

1. Compact plan to meet primary mission of food preparation for dining in the Community Room
2. Some space for teaching kitchen function
3. Serving station is a credenza in Community Room
4. Kitchen will be a big source of water use
5. Commercial Dishwater key to saving time and water
6. Planning on EPA WaterSense fixtures (low-flow)



Initial Kitchen Plan